Contact us

The motion sensor is an infrared human detection sensor, which, as opposed to factory automation sensors that are used with factory equipment, is designed to be incorporated into various devices that exist around us in daily life.
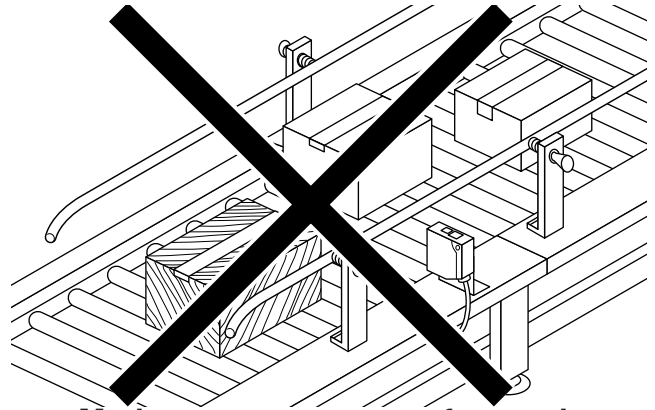
Motion sensors are not for use in factory automation.

Types of motion sensor
Motion sensors are divided into two types.

Passive infrared type

Designed to cover a wide area, this sensor detects human presence. The sensor, rather than emitting light such as from LEDs, detects the amount of change in infrared rays that occurs when a person (object), whose temperature is different from the surroundings, moves.

Sensor

Infrared radiation

Temperature difference

Infrared radiation

Movement

1. As this sensor detects temperature differences, it is well suited to detecting the motion of people by their body temperature.
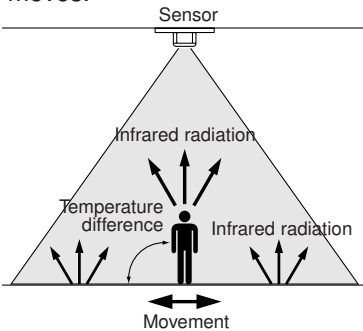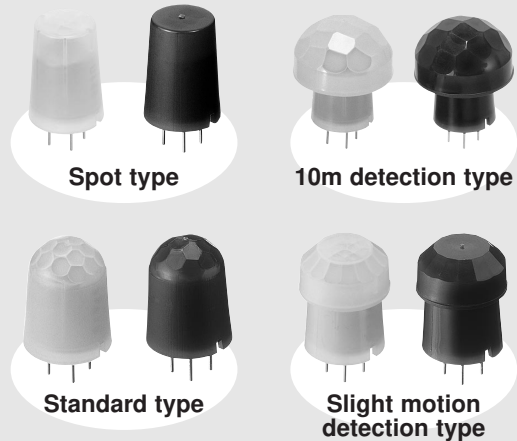2. Wide sensing area.
3. Detection distance cannot be set.

The world's smallest with a built-in amplifier

MP Motion Sensor 'NaPiOn'

Spot type

10m detection type

Standard type

Slight motion detection type

Area reflective type

As the name implies this sensor emits infrared rays from an LED. Using the reflection of those rays the sensor measures the distance to the person (object) and detects whether or not it is exists within a specific distance.

(1) Suitable for detection within specific ranges.
(2) Possible to select the detection distance.
   • Selection possible in 1 cm increments between 5 cm and 10 cm.
   • Selection possible in 10 cm increments between 20 cm and 200 cm.
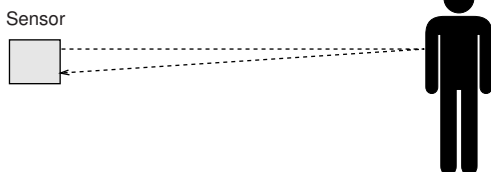
Sensor

A compact distance-type sensor that is not easily influenced by reflection ratio.

MA Motion Sensor

Short type (5 cm to 10 cm)

Middle type (20 cm to 80 cm)

Long type (Horizontal installation) (30 cm to 200 cm)

Long type (Vertical installation) (30 cm to 200 cm)
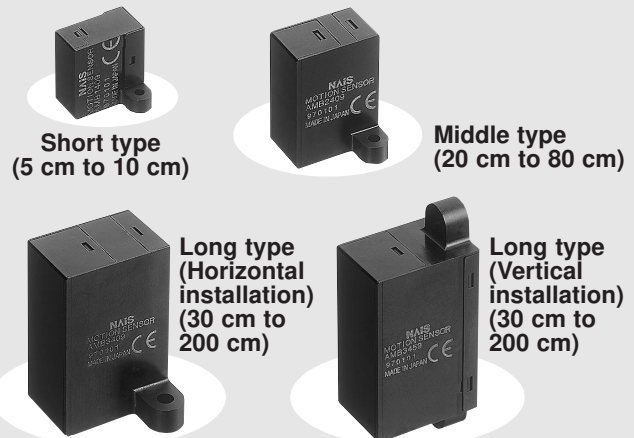
Application of MP Motion Sensor 'NaPiOn'

Automatically turn indoor lighting on and off

Method of use

Use as a human detection sensor to automatically turn lights on when a person is present in a room and to turn them off when nobody is there.

Points to consider when selecting a sensor

1. The presence of a person must be detected over a side area (room).
2. Even slight human motion must be detected.

MP Motion Sensor

Other application examples

Recommended conditions of use
1. Detection over a wide area (see note).
2. When the detection range extends to the wall or floor.

Note: If you wish to limit the range of detection, we recommended a spot type sensor.

Conference room control sensor
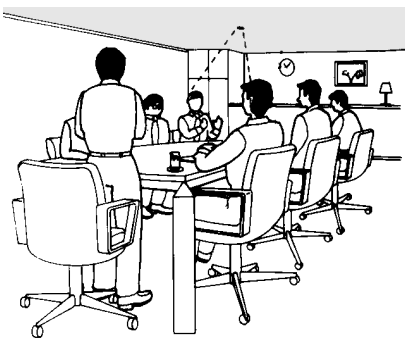
Automatic verbal address system
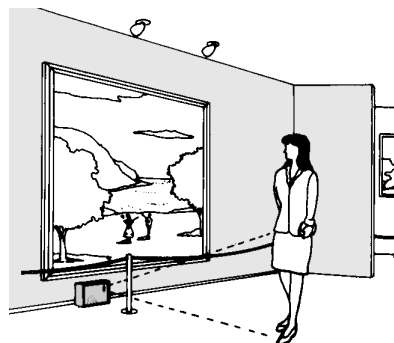
Lighting control for vending machine
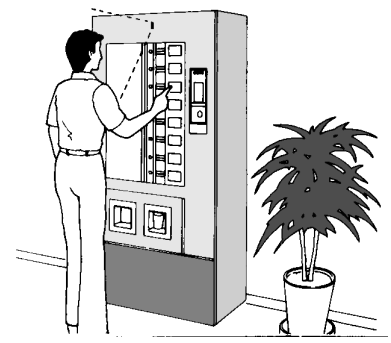
Amusement park facilities: Automatic control of devices (Establishes timing for device start-up.

Monitor camera
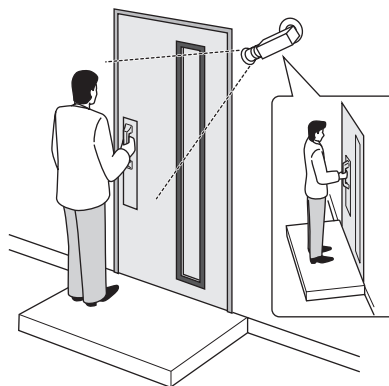
Control of air conditioner louver
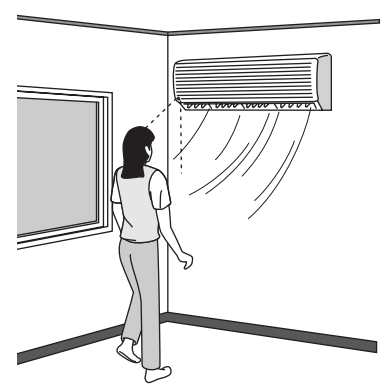
On/Off of smoke dispersal machine	Sink and dresser light	Energy saving mode of computer monitor
Verbal guidance machine for the blind	Detection of toilet use	Entry light
Desk light	On/off of TV power	Control ATM displays
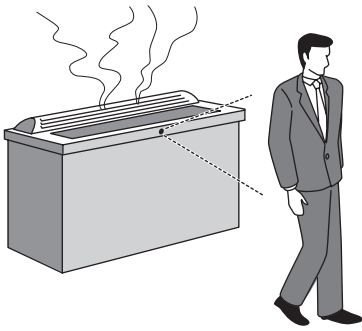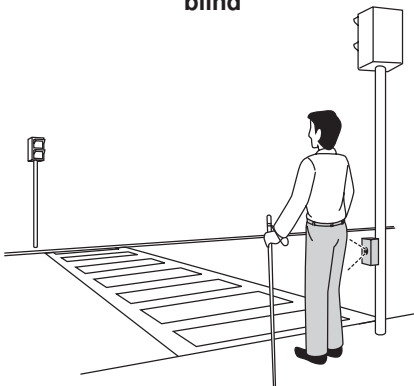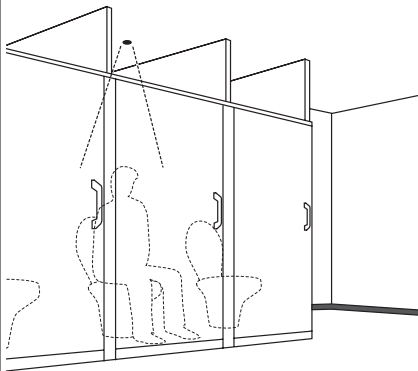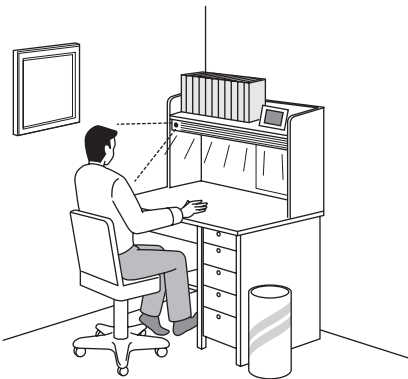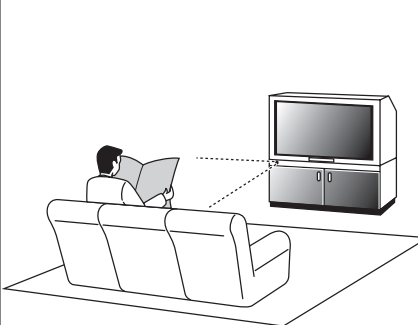
Application of MA Motion Sensor

Running machine in athletic club

Sensing area
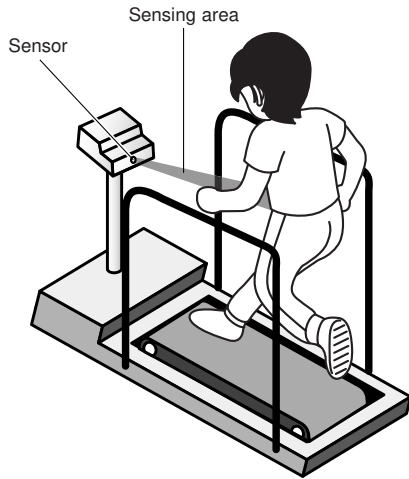
Sensor

Method of use

To prevent the runner from falling when he or she tires and becomes unable to keep up with the belt, the sensor slows the belt when the runner falls back out of the detection area of the sensor.

Points to consider when selecting a sensor

1. The detection area must be limited so that only the person using the running machine is detected.
2. The detection distance must be limited.

MA Motion Sensor

Other application examples

Recommended conditions of use

1. Non-moving people (objects) and objects without a temperature difference are to be detected.
2. The detection distance and area must be limited (see note).

Note: With the aim of widening the detection range, the external trigger type, which prevents reciprocal interference, is recommended when using multiple sensors.

Automatic water faucets
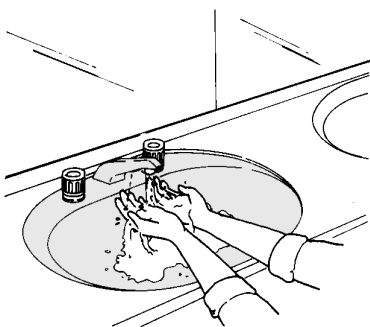
Non-contact switch for the toilet

Toilet seat opening & closing control
Lighting control
Flushing switch
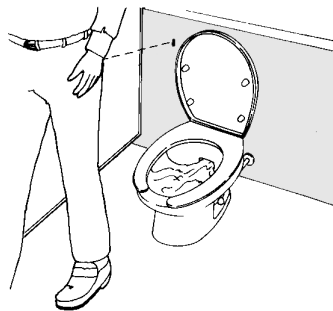
Customer detecting sensors for automated teller machines

Customer sensor

Welcome
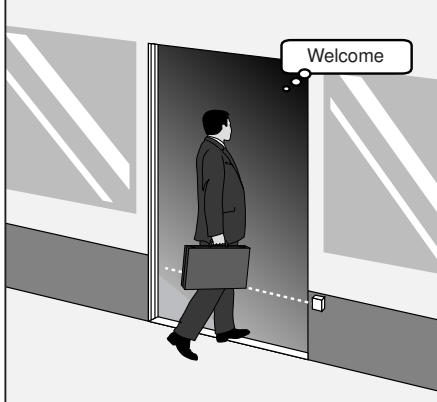
Automatic ticket gate
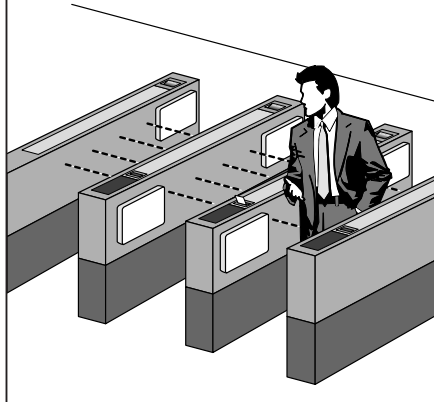
Parking meter
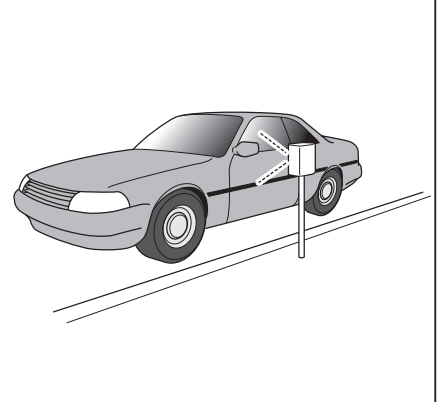
Application example

Select a sensor that suits the objective.

Examples of automatic advertising and automatic verbal guidance (ticket machines, vending machines, ATMs, illuminated photographs, etc.)

1. Advertising when a person walks past the device.

Detection is necessary over a wide area, therefore we recommended the passive infrared type 'NaPiOn' MP Motion Sensor.

2. When a person is close to the device:
- **The device is turned on**
- **Instructions for using the machine are heard**

The presence of a person in a very limited range must be detected, therefore the detection area is small. We recommend the area reflective type MA Motion Sensor, which enables the detection range to be select.

The current situation:

Techniques for reducing device power consumption will increase dramatically.

To preserve the global environment
At the Kyoto conference for the prevention of global warming held in 1997, it was agreed that "by 2008–2012, Japan will attempt to reduce the output of greenhouse gases by 6% with respect to 1990 levels."

Efforts in various fields to reduce greenhouse gases
Environmental action:
The beginning of "energy-saving" competition

Government

From the latter half of 1998 to the former half of 1999, the Ministry of International Trade and Industry began enforcement of the Energy Saving Act, which requires manufacturers to conserve energy.

The focal point of this act is the "Top Runner Method", whereby "Excellent products" having the highest energy efficiency are selected. This energy efficiency becomes a standard that other products are required to meet within a certain period. Manufacturers unable to meet this standard are subject to punishment. A total of ten products are scheduled for implementation, including automobiles and electrical appliances such as air conditioners, refrigerators, televisions, VCRs, and personal computers.

Manufacturers

"Energy saving" is becoming an increasingly important factor in consumer selection of products. Manufacturers are therefore promoting their technical prowess and aggressive stance with respect 10 environmental problems.

Motion Sensor application examples (1)

The recommended sensor is indicated by either of the following marks behind each application.

P ; Passive infrared type MP Motion Sensor 'NaPiOn'

A ; Area reflective type MA Motion Sensor

Air conditioner control **P**

Intruder alarm   **P** **A**
Glass breaking detector **A**

Crime prevention sensor **P** **A**

TV
(Energy conservation when **P**
nobody is home)

Automatic lighting **P**

Automatic ventilation fan **P**

Automatic lighting **P**

Automatic faucet **A**

Entry way light **P** **A**
(Automatic lighting)

Hallway light **P**
(Automatic lighting)

Gate light **P**
(Automatic lighting)
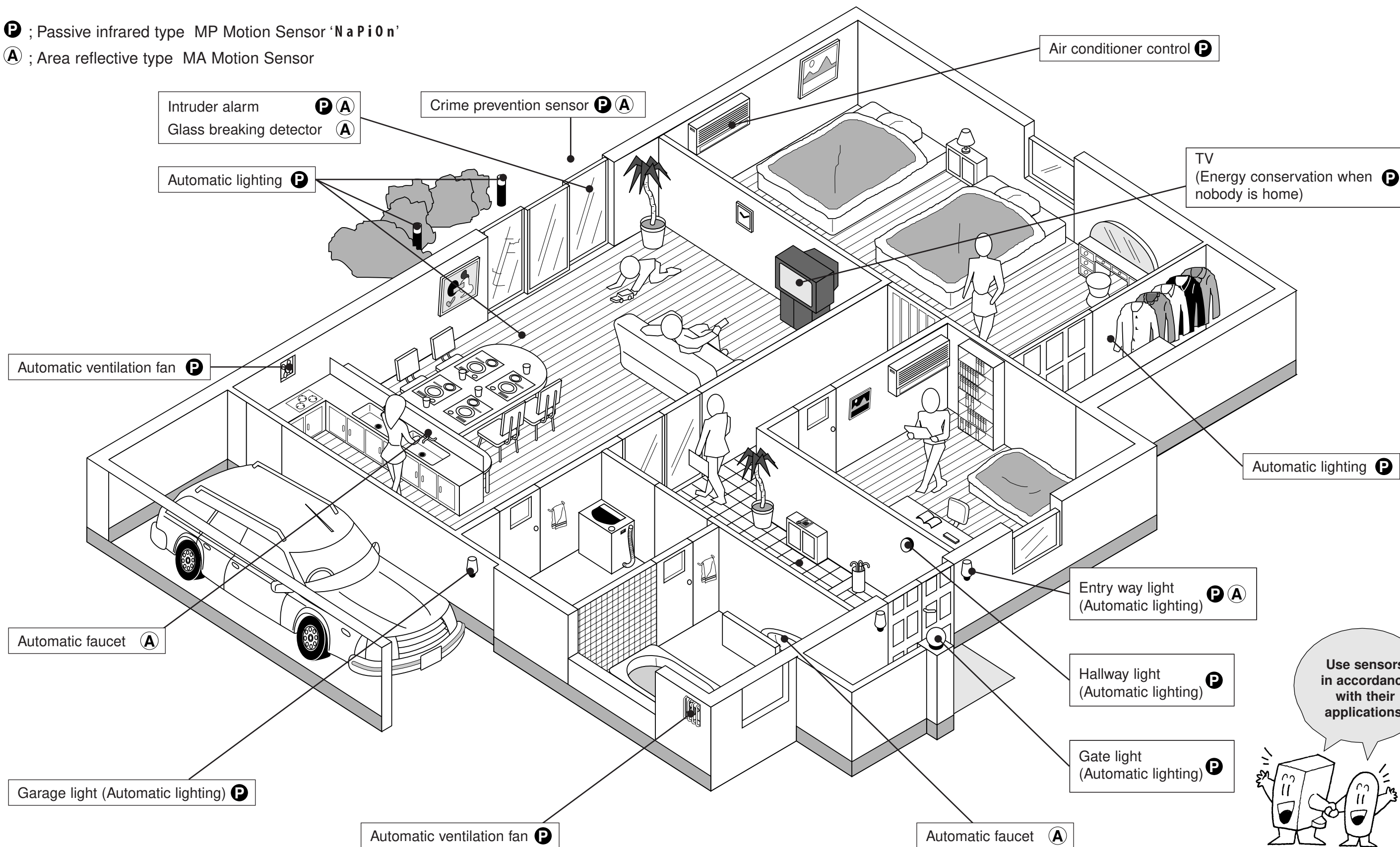
Use sensors in accordance with their applications.

Garage light (Automatic lighting) **P**

Automatic ventilation fan **P**

Automatic faucet **A**
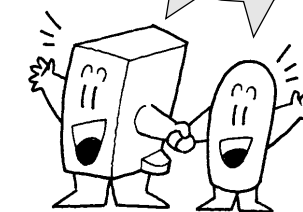
Motion Sensor application examples (2)

The recommended sensor is indicated by either of the following marks behind each application.

P ; Passive infrared type MP Motion Sensor 'NaPiOn'

A ; Area reflective type MA Motion Sensor

Office building

Athletic gym

Hospital

Amusement area

Station

Parking lot

Running machine **A**

Medical bed safety **P A**
(prevent people from being caught underneath an elevating bed)

Occupancy sensor **A**

Non-contact switch **A**

Automatic flushing **A**

Hand dryer **A**

Automatic ventilation fan **P**

Automatic lighting in conference room **P**

Automatic lighting for Karaoke room, display power **P**

Automatic toilet seat opening/closing **A**

Customer detection for 3-minute photo machine **P A**

Customer detection for automated teller machine **A**

Automatic lighting for vending machine **P**

Automatic lighting **P A**

Welcome!

Player detection at Pachinko machine, power for display of information terminal **P A**

Revolving door **A**

Security **P**

Telephone booth lighting **P A**

Air bag **P A**

Baggage detection in coin locker **P A**

Customer sensor **P A**

Automatic door **P A**

Detection of passengers getting on/off **A**

Permit dispenser for parking lot **A**

Automatic ticket gate **A**

Customer sensor for gasoline stations **A**

2 Operating principle of Motion Sensor

MP Motion Sensor 'NaPiOn'

Overall, from the standpoint of detection performance, noise resistance, causes of false detection and cost performance, the passive infrared type is the most practical means of detecting the human body without contact.

All objects on the earth emit light in accordance with their temperature and surface characteristics. Naturally, light (infrared radiation) is also emitted from our bodies. (This radiation is emitted from the body surface, and is centered around a wave-length of 10μm.)
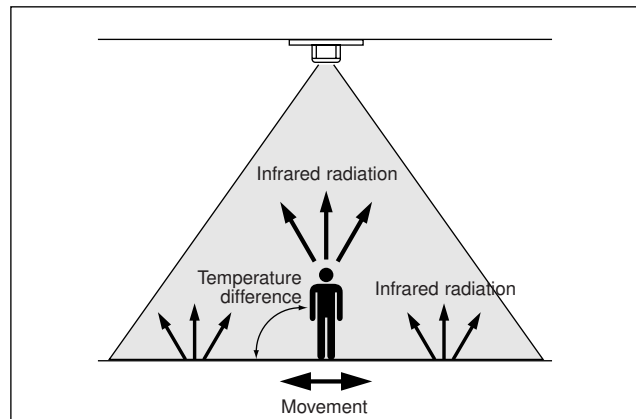**When a person enters the detection area of the sensor, the amount of infrared radiation incident on the sensor varies by the amount corresponding to the difference in temperature between the body surface and background.**

Radiation from
human body: 10μm

These sensors detect the human body by detecting the change in incident infrared radiation.

That is, the sensor is actuated by the difference in temperature between human body (which is a heat source) and floor, walls and other objects forming the background.

Infrared radiation

Temperature
difference

Infrared radiation

Movement

Detection area of standard type

TOP VIEW

5m
16.404ft

X

50°

2.5m
8.202ft

0°

2.5m
8.202ft

5m
16.404ft

50°

SIDE VIEW

5m
16.404ft

Y

41°

2.5m
8.202ft

0°

2.5m
8.202ft

5m
16.404ft

41°

Detection area   Y   Detection zone

3m

2

1

4m   3   2   1   2   3   4m   X

1

3m

(Max. 5.66m)

(Max. 7.42m)
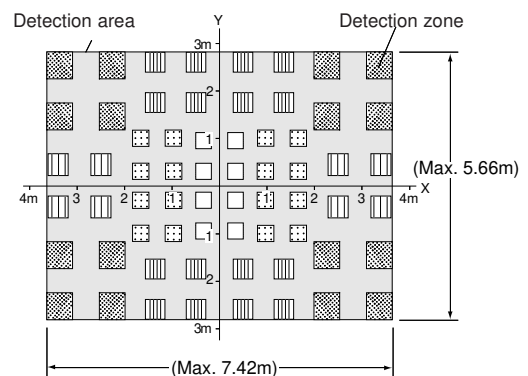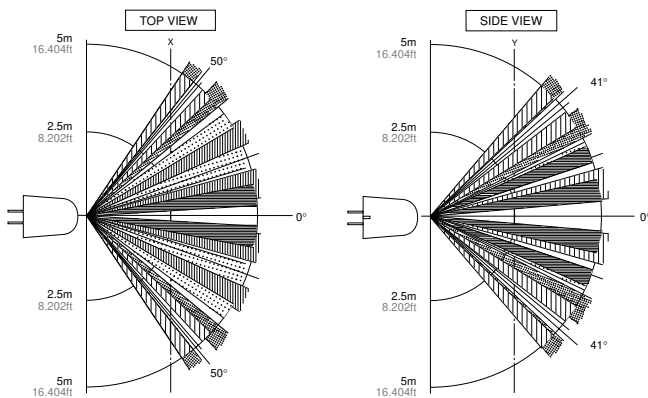
In the detection zone, above, the sensor turns on when a temperature change exceeds the regulated amount.

MA Motion Sensor

These sensors detect the human body via the area reflection system.

Reflected beam

Output

Non-contact switch

Light beam

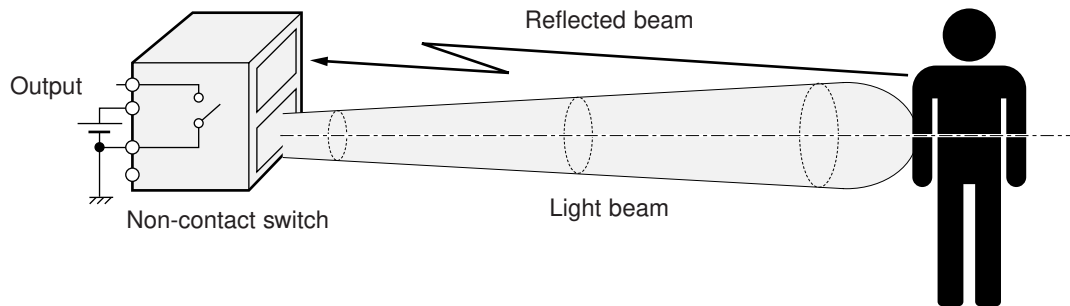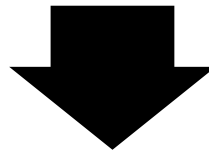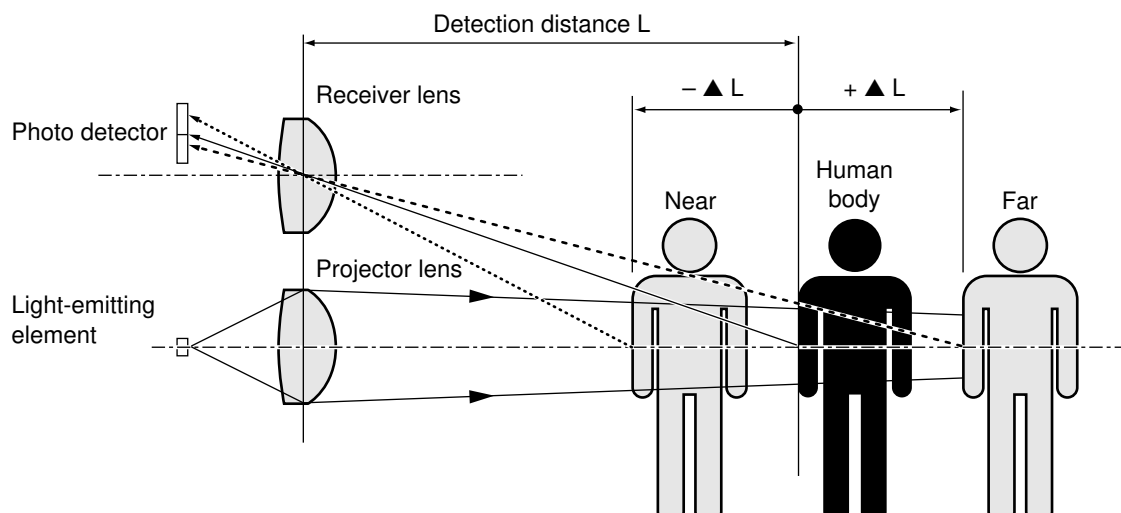The sensor sends out a ray of light toward the human body, then uses the reflected light to measure the distance and determine whether there is a person within a given distance of the sensor. If the sensor decides that there is a person within the given distance, it sets an output non-contact switch to ON.

The triple-angle distance measurement configuration makes it difficult to be affected by the color (reflection ratio) of the detection object. This is the high-precision distance measurement method used in the auto-focus systems in cameras.

Detection distance L

$- \blacktriangle L$ $+ \blacktriangle L$

Receiver lens

Photo detector

Near   Human body   Far

Projector lens

Light-emitting element

The system is configured so that the received light spot comes almost the center of the photo detectors when if a human body is located at the detection distance L. The system determines whether the body is farther (L+ ▲ L) or closer (L ▲ L) by the position of the received light spot.
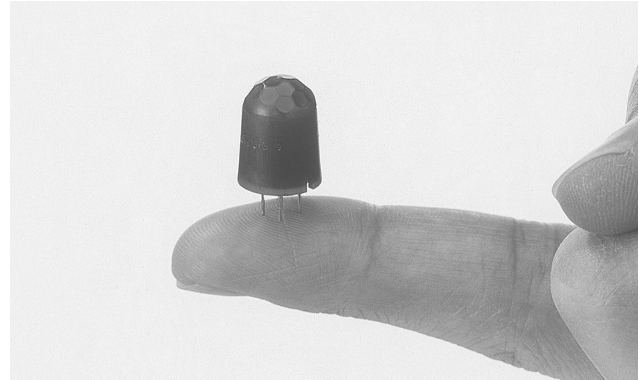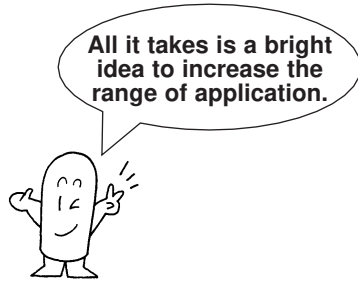
Passive infrared type MP Motion Sensor 'NaPiOn'

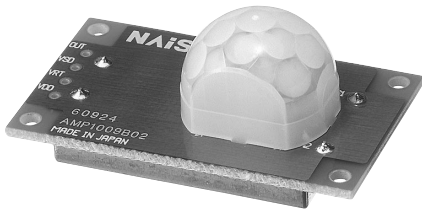**FEATURE 1** **The world's smallest with a built-in amplifier**

Easy to incorporate into small devices.

All it takes is a bright idea to increase the range of application.

Motion detecting sensor area type
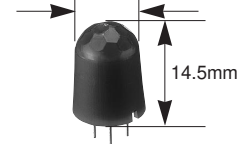
<Conventional type>

Actual size

About 1/10 the volume and 1/5 the lens surface area of conventional motion detecting sensors.

MP Motion Sensor 'NaPiOn'

Lens surface area Ø9.5mm
Mounting hole Ø9.8mm

14.5mm

Actual size **Standard type**

Here is the secret to the world's smallest sensor

Structural diagram
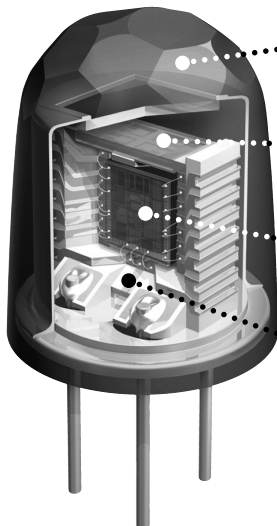
Our motion sensor is based on know-how developed over many years, including our proprietary technology for lenses, detector elements, ICs and mounting.

Small multi-lens

Proprietary high-precision molding technology is used to integrate 16 short-focal-point lenses with five different optical axes in order to reduce size.

Highly sensitive quad element

U-shaped slits are formed around the four light-receiving units to improve heat insulation, reduce element size and increase element sensitivity.

Single-chip IC with built-in amplifier and comparator

Proprietary circuit technology which is different from ordinary FET technology is used to create a single-chip IC which contains both an amplifier circuit and a comparator circuit.

MIPTEC (Microscope Integrated Processing Technology) application device

Employing MIPTEC which has our proprietary MID (Molded Interconnect Device) technology, the element, IC and chip component is mounted in a MID at high density and contained in a TO5 metal package (9.8 mm x 9 mm dia.).

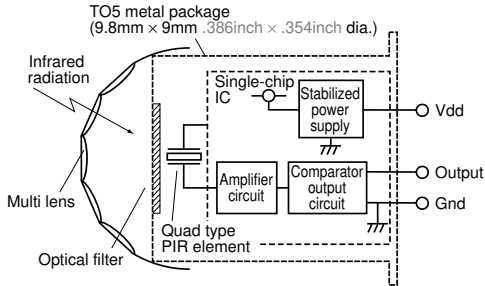**FEATURE 2** **Circuit design is easy because the amp and comparator are built in** (except for analog output type).

The digital output enables connection directly to microcomputers.

MP motion sensor block diagram

TO5 metal package
(9.8mm × 9mm .386inch × .354inch dia.)

Infrared radiation

Single-chip IC

Stabilized power supply — Vdd

Amplifier circuit | Comparator output circuit

Output
Gnd

Multi lens

Quad type PIR element

Optical filter

Key point

To achieve the same scheme as the 'NaPiOn' MP Motion Sensor, a sensor element, amplifier and comparator are required.
The output from the sensor element is extremely weak in the passive infrared scheme, thus the signal must be amplified and converted to an ON/OFF signal with a comparator circuit before output.

Lens | Sensor element | Amplifier circuit | Comparator circuit

Signal — Weak signal — Strong signal — On / Off — Output
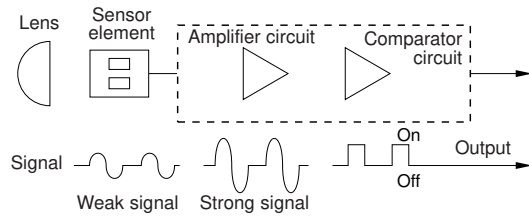
NaPiOn is not just a sensor element; it has a built in amp and comparator. Be sure to carefully check the functions, etc., when comparing with other company's products.

FEATURE 3 **Noise withstanding capability**

Shielding is increased because the amp circuit is built into the TO5 metal package.

Comparison table of noise with-standing capability

	Distance at which motion sensor is not affected by cellular phone noise
MP Motion Sensor	Min. 1 to 2cm .394 to .787 inch
Conventional type	Min. 1 to 2m 3.281 to 6.562ft
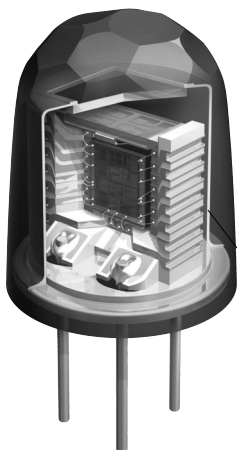
TO5 metal package

Key point

To achieve the same scheme as the NaPiOn MP Motion Sensor, a countermeasure for radiant noise in general is necessary. If noise enters the circuit between the sensor element and the amplifier, the noise will be amplified along with the weak signal, resulting in detection errors.
For this reason, shielding is necessary between the sensor element and the amplifier.

(Block diagram for a typical passive infrared sensor)

Lens | Sensor element | Amplifier circuit | Comparator circuit

Signal — Weak signal — Strong signal — On / Off — Output

Noise — **Detection error**

Signal — Output

Lens | Sensor element | Amplifier circuit | Comparator circuit
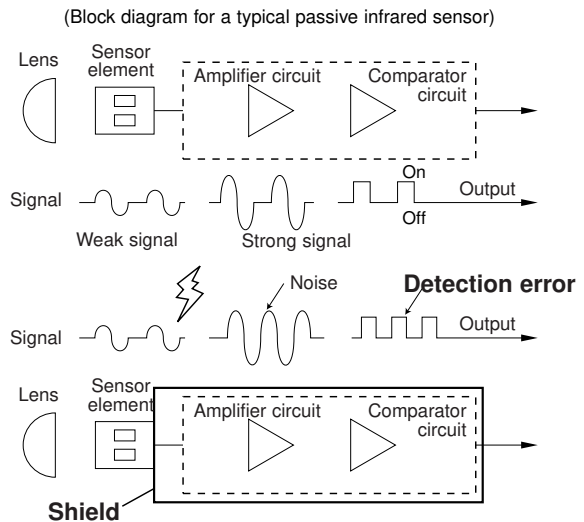
Shield

Shielding is taken care of in the 'NaPiOn'
(TO5 metal package includes shielding)
Regular same-system sensors require separate noise countermeasures to be taken.

Dual lens colors (white and black) are provided

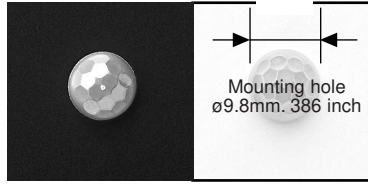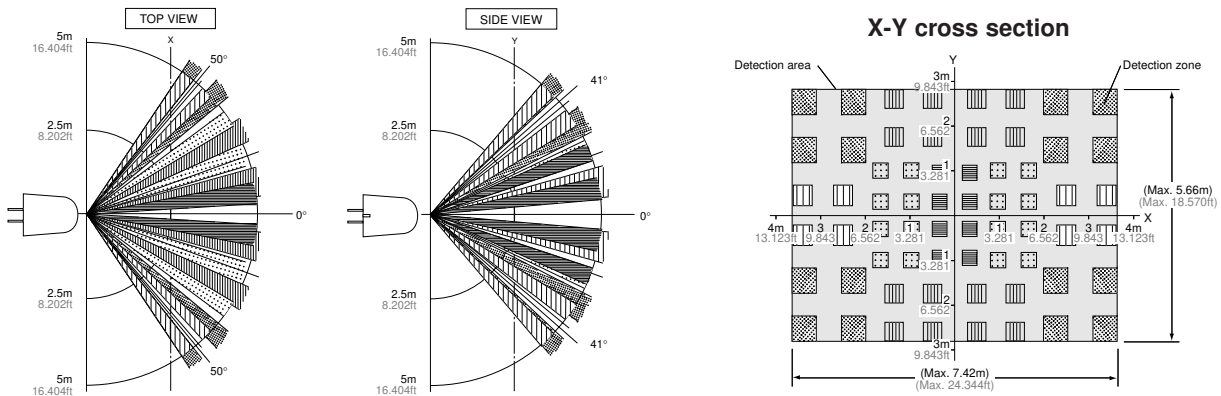**<Conventional type>**　　　　**<MP Motion Sensor 'NaPiOn'>**

Mounting hole
ø9.8mm. 386 inch

This provides greater flexibility in equipment design.

Four detection performance types are available

Detection Performance

1. Standard type

TOP VIEW

5m
16.404ft

X

50°

2.5m
8.202ft

0°

2.5m
8.202ft

5m
16.404ft

50°

SIDE VIEW

5m
16.404ft

Y

41°

2.5m
8.202ft

0°

2.5m
8.202ft

5m
16.404ft

41°

X-Y cross section

Detection area

Y

3m
9.843ft

2
6.562

1
3.281

Detection zone

(Max. 5.66m)
(Max. 18.570ft)

4m
13.123ft

3
9.843

2
6.562

1
3.281

X

1
3.281

2
6.562

3
9.843

4m
13.123ft

1
3.281

6.562

3m
9.843ft

(Max. 7.42m)
(Max. 24.344ft)

A wide horizontal detection range has been achieved for situations where the sensor will be attached to a wall and used to detect passersby.
Notes:
1) Detection is also possible with the sensor attached to the ceiling.
2) In situations where the customer wants use a sensor attached to a wall to detect slight movements, recommend the slight movement detection type.
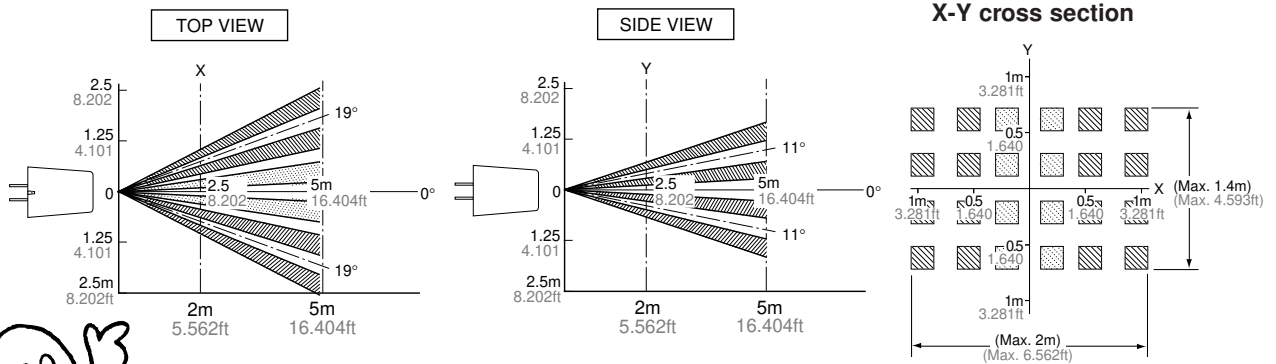
2. Slight motion detection type

X-Y cross section
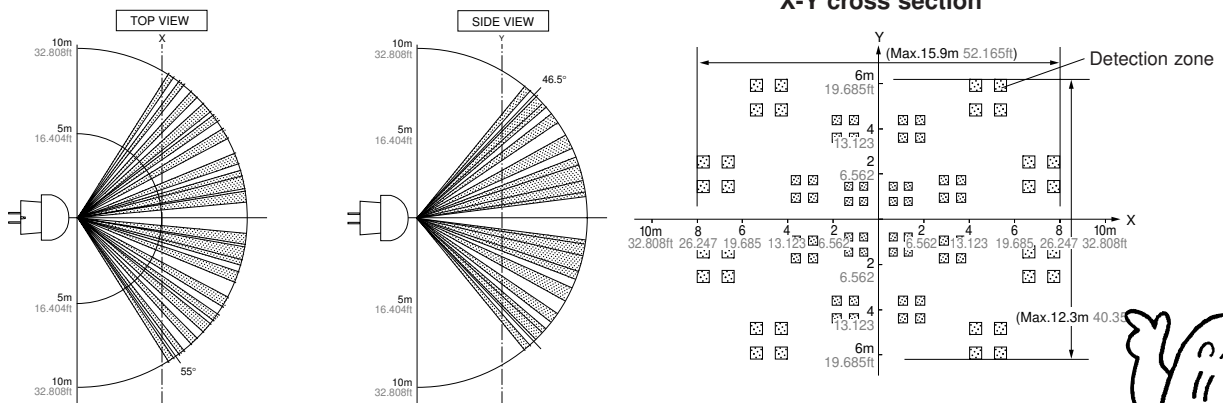
Detection zone
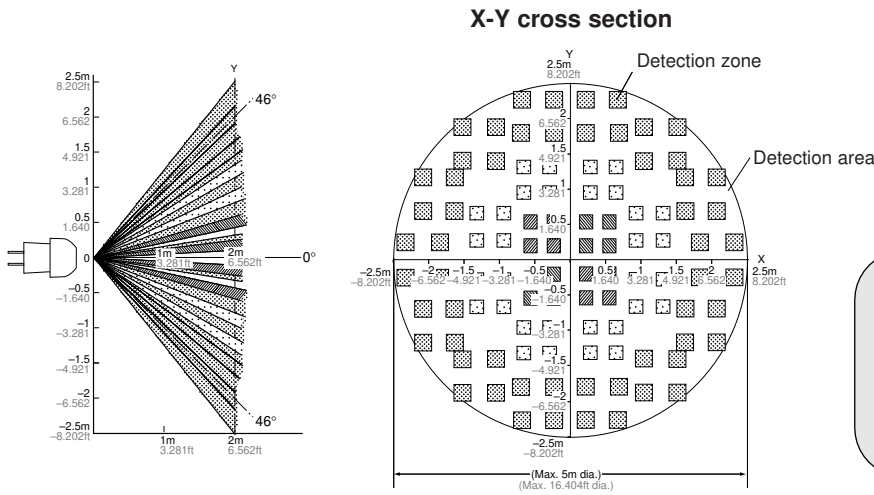
Detection area

For ceiling attachment, this sensor is designed to detect slight movements in conference rooms and other rooms where people gather. Detection is also possible attached to a wall.

(Max. 5m dia.)
(Max. 16.404ft dia.)

3. Spot type

| TOP VIEW | SIDE VIEW |

X-Y cross section

(Max. 1.4m)
(Max. 4.593ft)

(Max. 2m)
(Max. 6.562ft)

Ideal for detecting people in small areas, such as for voice guidance or entry light control.
Note: Recommended when you want to further restrict the detection range.

4. 10m detection type

X-Y cross section

| TOP VIEW | SIDE VIEW |

Detection zone

(Max.15.9m 52.165ft)

(Max.12.3m 40.35

Ideal for detecting people over larger areas than the standard type.

Note on the detection zone:

As indicated at right, the detection zone
has polarity. If two objects enter the zone in
the + and − directions at the same time,
the signals from each may cancel each
other and make detection impossible in the
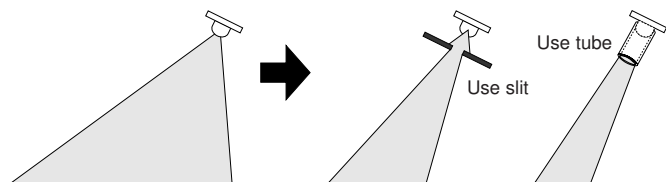vicinity of the maximum detection distance.

Object
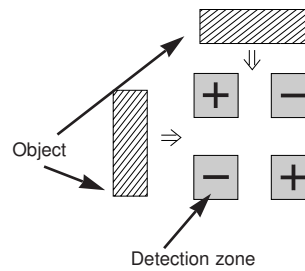
Detection zone

Application methods

1. Setting the sensor so it will not detect people who are far away

Sensor

Sensor

Detection area
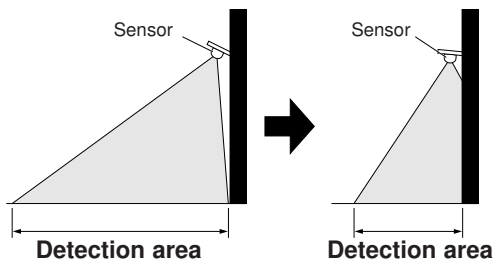
Detection area

2. For detection in only a limited area

Use tube

Use slit

FEATURE 6 **Analog output type also available that allows sensitivity adjustment**

Designed for situations in which the surrounding environment has an adverse effect
on performance (when you want to reduce the difference between the background
temperature of summer and winter, or eliminate the effect of varying air conditioner
output). Being able to check the degree of influence using an analog value, the user
can set the threshold whereby such influence can be ignored.

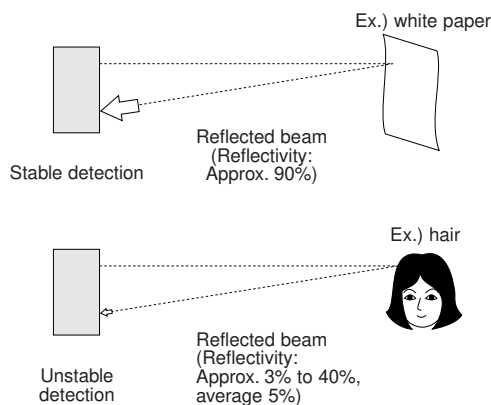| Area reflective type | **MA Motion Sensor** |

FEATURE 1 **Because of the distance-measured type, accurate sensing is possible with little influence caused by reflection ratio of the detection object.**

With commonly used light intensity type sensors (which detect objects by the amount of reflected light), performance is greatly affected by the reflectivity of the detected object.
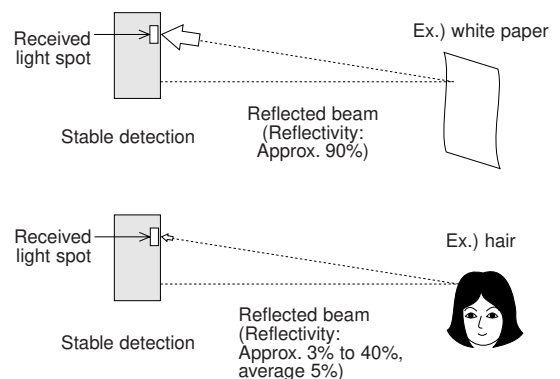
However, since the MA motion sensor does not detect based on the amount of reflected rays, it features the ability not to be easily influenced by the reflection ratio because detection is based on the position of the receiving spot in the receive element.

Light volume detecting type

Ex.) white paper

Reflected beam
(Reflectivity:
Approx. 90%)

Stable detection

Ex.) hair

Reflected beam
(Reflectivity:
Approx. 3% to 40%,
average 5%)

Unstable detection

Since detection is determined by intensity, the influence of reflection ration is likely.

MA motion sensor

Received light spot

Ex.) white paper

Reflected beam
(Reflectivity:
Approx. 90%)

Stable detection

Received light spot

Ex.) hair

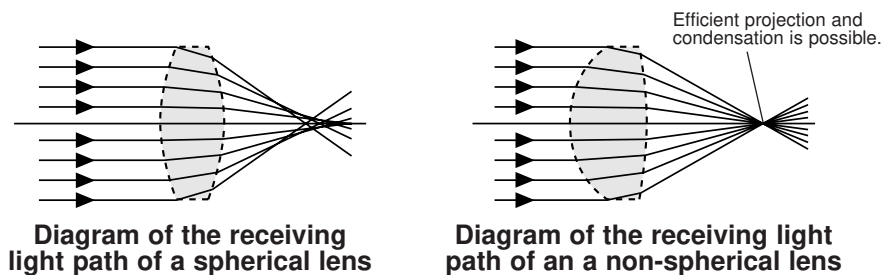Reflected beam
(Reflectivity:
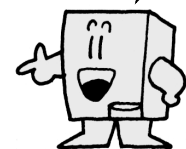Approx. 3% to 40%,
average 5%)

Stable detection

The system detects whether an object is present by the position of the received light spot on a photo detector, so it is not greatly affected by reflectivity.

A non-spherical lens is used both for projector and receiver.

Using a non-spherical lens in this sensor, the projector lens can produce the incident light efficiently from the light-emitting element. In addition, the receiver lens can efficiently gather the entering light into the photo detector. As a result, an accurate distance measurement can be made even if the detected object has low reflectivity.

Efficient projection and condensation is possible.

Diagram of the receiving light path of a spherical lens

Diagram of the receiving light path of an a non-spherical lens

Non-spherical lens!

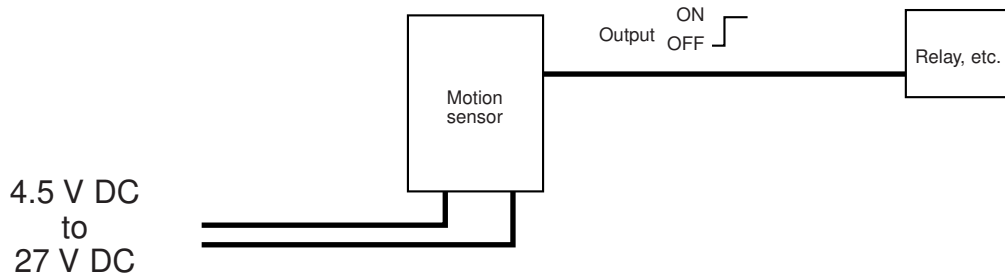**The sensor operates with high precision, even if the reflectivity of the detected object is low.**
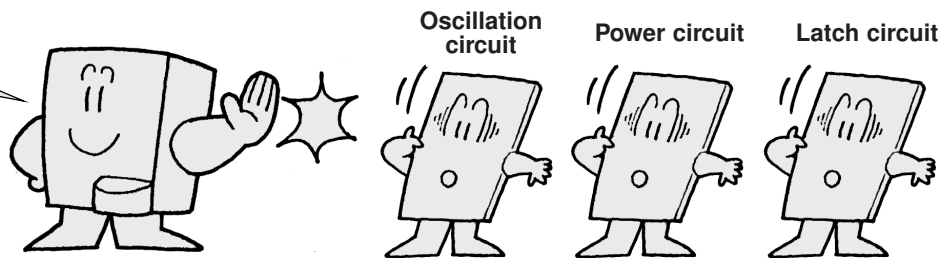
A built-in oscillation circuit type (internal trigger) and an external triggering type are available.

Built-in oscillation circuit type

Simply connect a DC power source and the sensor is ready for use.

Output ON / OFF

Motion sensor

Relay, etc.

4.5 V DC
to
27 V DC

Just connect a DC power source and you're ready to go!

Oscillation circuit   **Power circuit**   **Latch circuit**

External triggering type

Sensors can be connected sequentially.
Input each external trigger signal in sequence to prevent reciprocal interference.

Sequential connection is OK!

Can be driven by a battery

Establishing an interval between external trigger signals reduces current consumption in the sensor.

Example of usage

Automatic flushing of men's urinal
Rate of use of urinal: 30 minutes per day
Trigger period: 2 seconds per trigger
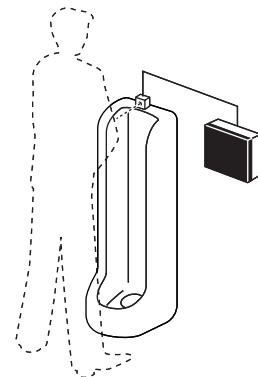
	Built-in oscillation circuit type	External trigger
Average current consumption	5480µA	160.5µA
Battery life (4 alkaline batteries)	Approx. 30 days	Approx. 1000 days (2.8 years)

Can be used with a number of different power supply voltages

1) The 5 V DC type (4.5 to 6.5 V DC)
2) The free-ranging power type (6.5 to 27 V DC)
They support the DC power supplies of electronic products and equipment in general.

FEATURE 4 — Ultra-compact size, suitable for built-in applications

Motion sensors are designed to be built into equipment. We have achieved an ultra-compact size, so these sensors will not affect equipment size or interfere with design.
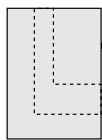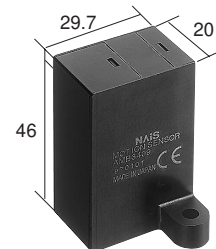
A series of three types to suit the detected object

Three types "Short type", "Middle type" and "Long type" are available.
Naturally, the shorter the distance, the more compact the type.
Also, the rated detection distance can be changed at the factory to meet specific customer needs.
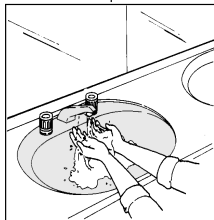
Type	Rated detection distance (Range of variation)
Short type	Change possible in 1 cm increments between a 5 cm and 10 cm range.
Middle type	Change possible in 10 cm increments between a 20 cm and 80 cm range.
Long type	Change possible in 10 cm increments between a 30 cm and 200 cm range.
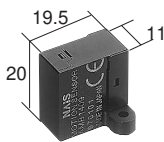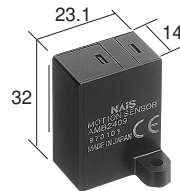
Short type	Middle type	Long type
19.5, 11, 20	23.1, 14, 32	29.7, 20, 46
10 cm (3.937 inch)	80 cm (31.496 inch)	200 cm (78.74 inch)
Detects hands Intentionally uses a hand-based non-contact switch	Used as an ON/OFF switch for when a person stands in front of equipment.	Set-up on the ceiling of a room, and used to detect whether a person is in the room or seated.
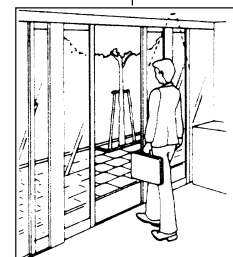
As shown below, the detection area of this sensor is the area up to the rated detection distance excluding the non-sensitive zone.

Non-sensitive zone
Rated detection distance
Several millimeters to several centimeters
Active zone (detection zone)
Receiver lens
Reflected light (returns to receiver lens)
Does not return to receiver lens
Projector lens
Infrared radiation
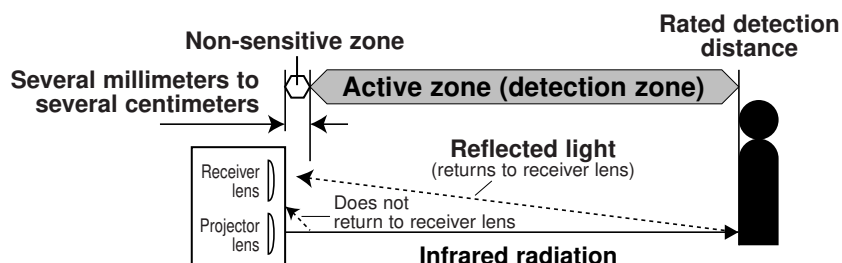
FEATURE 5 **These sensors are highly resistant to disturbing ambient light, and can be used worry-free in bright spaces**

Factory automation sensors are used under conditions which are closely controlled to suit the application. MA motion sensors, however, are built into equipment, so they may sometimes be used at locations which are exposed to sunlight (however, the direct sunlight to sensor is impossible).
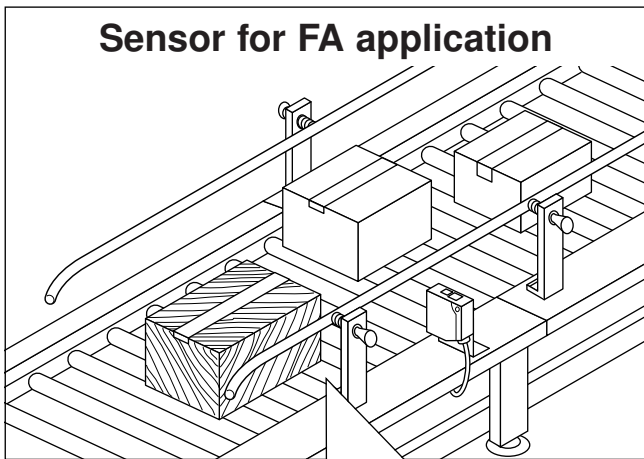
Sensor for FA application	**MA Motion Sensor**
Closely controlled environment	**Sensor may be used at a bright location which are exposed to sunlight**

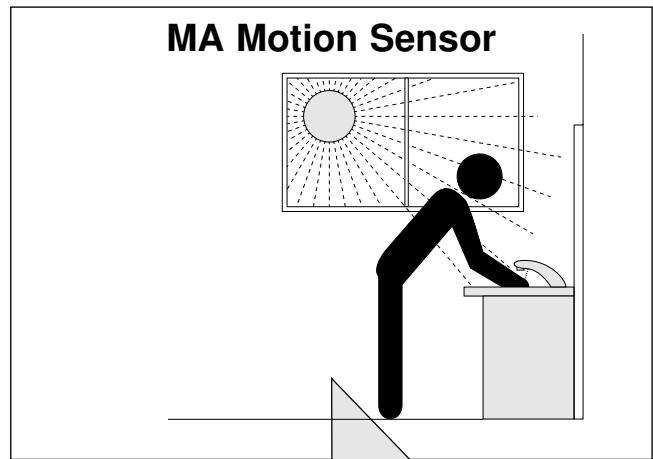**Usable ambient brightness (ambient light immunity) is one of the important points to be checked when using sensors in bright locations.**

Normally, for factory automation applications the usable ambient brightness is 3,000 to 10,000 lx.	MA motion sensors can operate at 30,000 lx, i.e, the brightness near a window on a summer day.

FEATURE 6 **Circuit design is easy**

The detection result takes the form of ON/OFF output (open collector transistor output), thus a reference circuit is not necessary and circuit design is easy.

FEATURE 7 **All models with built-in oscillation circuit type meet CE mark standards**

Conforms with EMC directive for CE certification vital for use in Europe.

FEATURE 8 **High speed detection is possible**

• Built-in oscillation circuit type: measuring period 8 ms/time (typical)
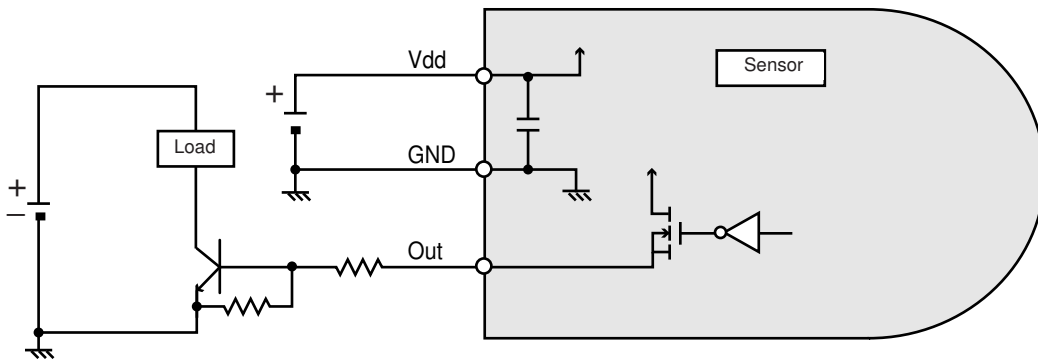• External triggering type: measuring period 5 ms/time (typical)

1. How to use

MP Motion Sensor 'N a P i O n'

The MP Motion Sensor has three pins. Connections are as follows:

(Digital output type)

1. Wiring diagram

Vdd: Input power source (DC)
GND: GND
Out: Output (Comparator)

2. Timing chart

Power supply	ON / OFF
Detection state	Detect / Not detect
Sensor output	ON / OFF

Circuit stability time
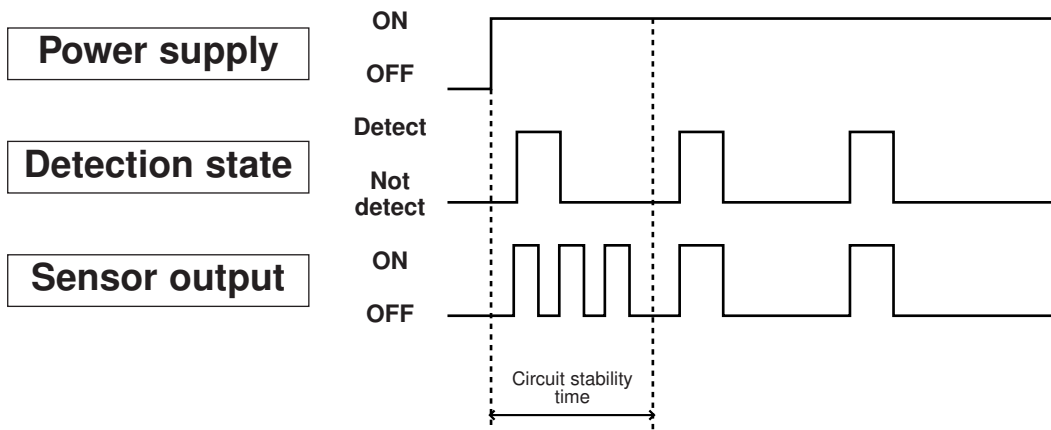
Note: Circuit stability time: Max. 30 sec.
While the circuitry is stabilizing after the power is turned on, the sensor output is not fixed in the "on" state or "off" state. This is true regardless of whether or not the sensor has detected anything.
For this reason, please combine with a device that contains a function for preventing output during this time.

Note: The spot and 10m detection types are subject to change without notice due to improvements in product performance, characteristics and dimensions. Please contact us with any inquiries you may have.

(Analog output type)

1. Wiring diagram

Iout : MAX. 50 μA

2. Timing chart (analog output type)

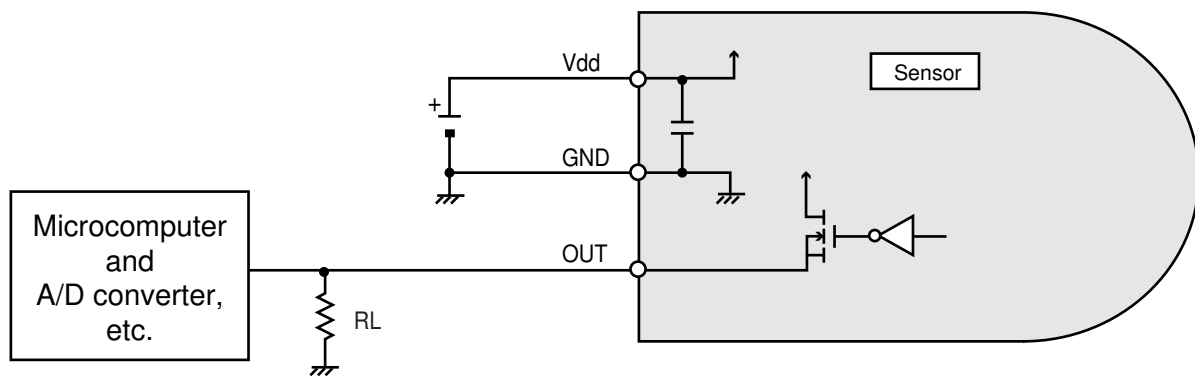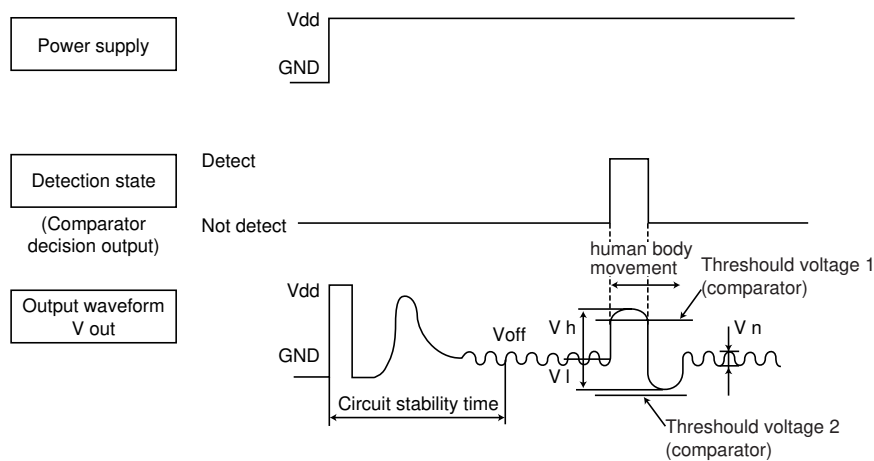Note: Circuit stability time: Max. 45 sec.
While the circuitry is stabilizing after the power is turned on, the sensor output is not fixed in the "on" state or "off" state. This is true regardless of whether or not the sensor has detected anything.
For this reason, please combine with a device that contains a function for preventing output during this time.

MA Motion Sensor

The MA Motion Sensor has four pins. Standard connections are as follows:

(Built-in oscillation circuit type)

1. Wiring diagram

The output is open collector transistor output.
Output voltage (Load voltage): 30 V
Output flow current (Max. output current): 100 mA

Circuit for a common source voltage for the sensor and the load

1. Output
2. GND
3. Power source
4. Not used
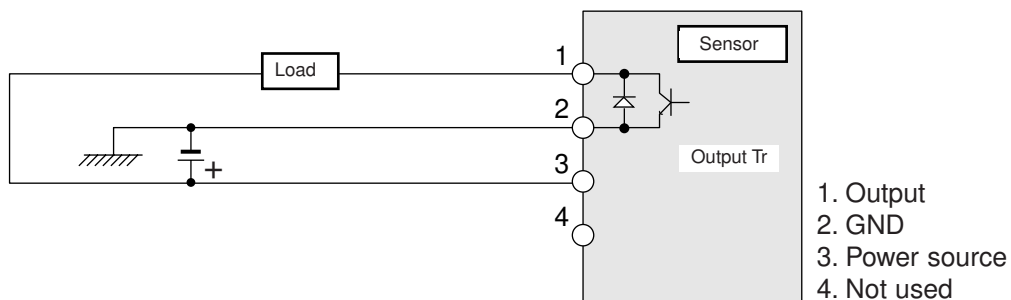
Circuit for separating the sensor source voltage and the load source voltage
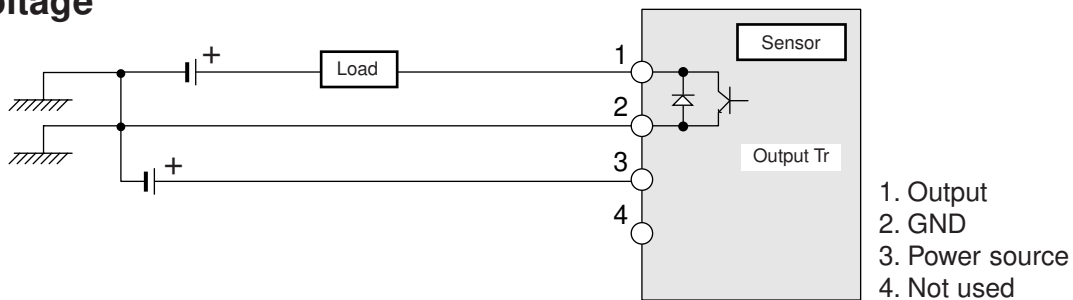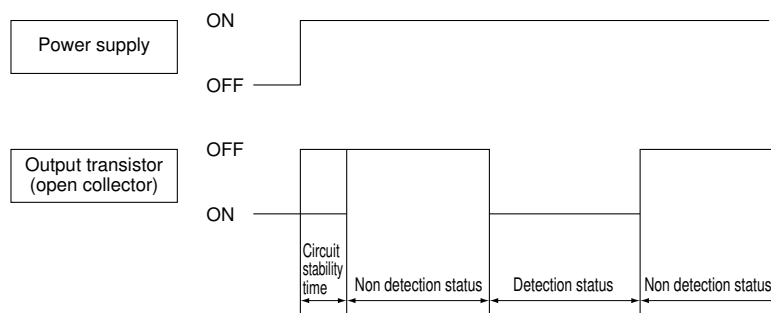
1. Output
2. GND
3. Power source
4. Not used

2. Timing chart

Notes: 1. Circuit stability time : Max. 12 ms.
2. During the time taken for the circuit to stabilize after the power is turned on, the ON/OFF status of the output transistor is not determined by whether the sensor is in the detection status or non-detection status.

(External trigger type)

1. Wiring diagram

Notes: 1. Output transistor is an open collector.
   Detection status: Output transistor ON (connected to GND)
   Detection status: Output transistor OFF (open status)
2. External trigger input is as follows:
   High level: Open
   Low level: GND (Max. 0.8 V)
   Be absolutely sure not to apply high level voltage.
3. For the trigger type, in order to maintain a heavy power noise function, be sure to provide a capacitor (at least 33 µF) at the sensor power input terminal. This will stabilize the power supply voltage.

2. Timing chart

Notes: 1. Circuit stability time : Max. 12 ms.
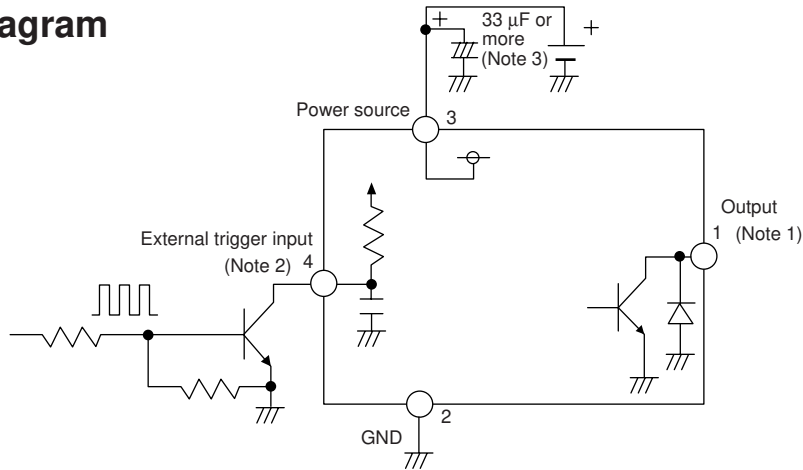2. During the time taken for the circuit to stabilize after the power is turned on, the ON/OFF status of the output transistor is not determined by whether the sensor is in the detection status or non-detection status.
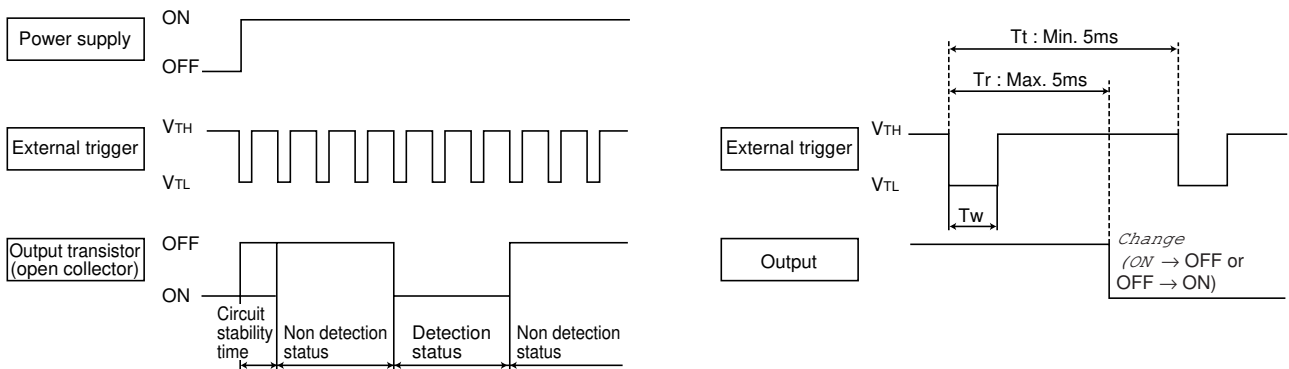
Note: 1. The sensor recognizes that an external trigger has been input at the $V_{TH} \rightarrow V_{TL}$ edge of the external trigger.

2. Cautions for use

Cautions for MP Motion Sensor 'NaPiOn'

1. Checkpoints relating to principle of operation

MP motion sensors are passive infrared sensors which detect changes in the infrared rays. They may fail to detect successfully if a heat source other than a human being is detected or if there are no temperature changes in or movement of a heat source. Care must generally be taken in the following cases. The performance and reliability of the sensors must be checked out under conditions of actual use.

<1> Cases where a heat source other than a human being is detected.

1) When a small animal enters the detection range.
2) When the sensor is directly exposed to sunlight, a vehicle's headlights, an incandescent light or some other source of far infrared rays.
3) When the temperature inside the detection range has changed suddenly due to the entry of cold or warm air from an air-conditioning or heating unit, water vapor from a humidifier, etc.

<2> Cases where it is difficult to detect the heat source

1) When an object made of glass, acrylic or other subject which far infrared rays have difficult passing through is located between the sensor and what is to be detected.
2) When the heat source inside the detection range hardly moves or when it moves at high speed; for details on the movement speed, refer to the section on the performance ratings.

2. Other handling cautions

1) Be careful not to allow dust or dirt to accumulate on the lens as this will adversely affect the detection sensitivity.
2) The lens is made of a soft material (polyethylene). Avoid applying a load or impact since this will deform or scratch the lens, making proper operation impossible and causing a deterioration in its performance.
3) The sensor may be damaged if it is exposed to static with a voltage exceeding ±200V. Therefore, do not touch its terminals directly, and exercise adequate care in the handling of the sensor.
4) When the leads are to be soldered, solder them by hand for less than 3 seconds at a temperature of less than 350°C 662°F at the tip of the soldering iron. Avoid using a solder bath since this will causing a deterioration in the sensor's performance.
5) Do not attempt to clean the sensor. Cleaning fluid may enter inside the lens area causing a deterioration in performance.
6) When using the sensors with cables, it is recommended that cables which are shielded and as short as possible be used in order to safeguard against the effects of noise.

Cautions for MA Motion Sensor

1. Ambient operating conditions

1) Avoid using the sensor in environments containing excessive amounts of steam, dust, corrosive gas, or where organic solvents are present.
2) When the sensor is used in noisy environments, connect a capacitor (minimum 33 μF) across its power input terminals.

2. Wiring

1) Check all wiring before applying power. Incorrect wiring may damage the internal circuit (in particular, check that the connection to the power supply is not reversed.)
2) Avoid excessive removing and replacing of the connector.

3. Detector surface (Optical surface)

1) Keep the detector surface clean. Excessive dust or dirt on the detector surface will deteriorate the sensing performance.
2) Do not allow condensation or freezing to occur on the surface of the sensor. If condensation or freezing does occur at low temperatures, the sensor may not detect objects correctly.
3) This product is designed to detect the existence of human body. The sensor will not detect objects consisting of a low reflective material (e.g., an object coated with black rubber, etc.) or of a highly reflective material (e.g., mirror, glass, coated paper, etc.)

4) The front surface of the lens and case are made of polycarbonate resin and can withstand water, alcohol, oils, salts and weak acids. Other fluids such as alkalines, aromatic hydrocarbons and halogenated hydrocarbons may melt or swell the lens and case, please do not have such fluids touch the lens and case.
5) To protect the inner circuit, wiring should be max. 3 m 9.843 ft..

4. Recommended installation procedure

Install the MA motion sensor so that it is orientated correctly in relation to the pass directions of the target objects as shown in the figure below.
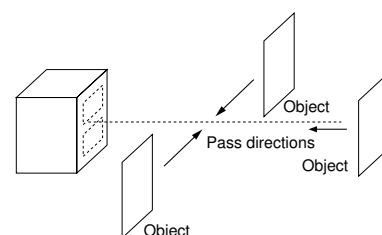
※ → stands for pass direction of the target object.

Notes for Motion Sensor

1. Ambient operating conditions
  1) Temperature: Refer to the absolute maximum ratings for the temperature of each individual sensor.
  2) Humidity: 15% to 85% RH (No freezing nor condensation at low temperature)
  3) Atmospheric pressure: 86 to 106 kPa
  4) The sensors do not have a water-proof or dust-proof construction. Depending on the ambient operating conditions, some means of providing protection from water and dust and preventing the formation of ice and condensation must be provided prior to using the sensors.
  5) Take care to avoid exposing the sensors to heat, vibration or impact since malfunctioning may result.

2. Concerning external surge voltages
  Since the internal circuitry may be destroyed if an external surge voltages is supplied, provide an element which will absorb the surges. The levels of the voltage surges which the sensor can withstand is given below.
  MA motion sensors: 500 V (±1.2 x 50μs unipolar full-wave voltage)
  MP motion sensors: Within the supply voltage given in the absolute maximum ratings.

3. Concerning power supply-superimposed noise
  Use a regulated power supply as the power supply. Otherwise, power supply-superimposed noise may cause the sensors to malfunction. The levels of noise which the sensor can withstand is given below.
  MA motion sensors: ±200 V (50ms, 1μs wide square waves)
  MP motion sensors: ±20 V (50ms, 1μs wide square waves)

4. Drop damage
  If the sensor is dropped, damage can occur resulting in incorrect operation. If dropped, be sure to do a visual check of the exterior for noticeable damage and check the operation characteristics for faulty operation.

5. Concerning the circuit sides
  Since the circuit sides given in this catalog are not protected in terms of circuit design, check out the performance and reliability of the circuits prior to using the sensors.

6. The technical information contained in this catalog is used to explain general operation and use of the products. By this usage, neither our company nor any third party grants the right to use intellectual property copyrights or any other copyrights.

⚠ SAFETY PRECAUTIONS
Head the following precautions to prevent injury or accidents.

• Do not use these sensors under any circumstances in which the range of their ratings, environment conditions or other specifications are exceeded. Using the sensors in any way which causes their specifications to be exceeded may generate abnormally high levels of heat, emit smoke, etc., resulting in damage to the circuitry and possibly causing an accident.

• Before connecting a connector, check the pin layout by referring to the connector wiring diagram, specifications diagram, etc., and make sure that the connector is connected properly. Take note that mistakes made in connection may cause unforeseen problems in operation, generate abnormally high levels of heat, emit smoke, etc., resulting in damage to the circuitry.

• Do not use any motion sensor which has been disassembled or remodeled.

• The sensor has two malfunction modes: short circuit and open.
  The short circuit mode may be triggered by an increase in temperature. In order to ensure safety, especially in important applications, please consider suitable safety measures such as a protective circuit or protection device.
  – Various safety machines and devices
  – Traffic signal lights
  – Crime and disaster prevention devices
  – Control devices and other devices that concern the safety of trains and vehicles.
  – Other important devices

Circuitry

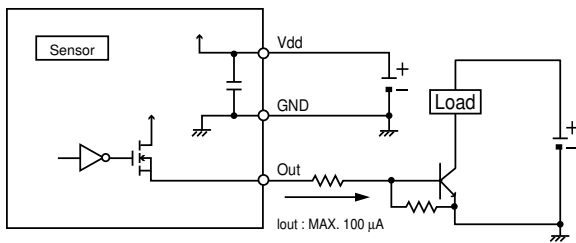### Q1

How should the sensor be wired?

A

1. Pin functions are as follows:

Vdd Power source (+)
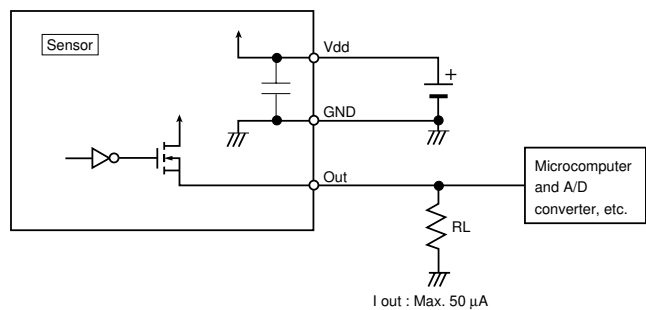GND Power source (-)
Out Output terminal

2. Connect the pins as follows:

Connect the (+) terminal of the power source to Vdd.
Connect the (-) terminal of the power source to GND.

1) Digital output type

Sensor
Vdd
GND
Load
Out
Iout : MAX. 100 µA

2) Analog output type

Sensor
Vdd
GND
Out
RL
Microcomputer and A/D converter, etc.
I out : Max. 50 µA

Q2

Can the circuit stabilization time (wait time) be shortened?

A

No.

The circuit stabilization time is the time required for the internal circuit to stabilize after the power is turned on. During this time correct detection cannot take place and the output is unstable.

ON
Power supply OFF

Detection state

ON
Sensor output OFF

Right here!

Circuit stability time
MAX. 30 sec.

Please wait!